

# -Virtual Discussion-

## Web-based Discussion Forums in Political Science

By Tim Groeling

*University of California at San Diego  
Department of Political Science and Center for Teaching Development*

[tgroeling@ucsd.edu](mailto:tgroeling@ucsd.edu)

<http://weber.ucsd.edu/~tgroelin>

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## Abstract:

*On-line discussion, while promising in theory, often turns out to be disappointing in application. Low levels of student participation are a particularly vexing and common problem. I argue that to overcome these chronic problems, instructors must recognize the collective action problems inherent in on-line discussion and address them, primarily through the use of selective incentives.*

*I test this contention using on-line experiments conducted on undergraduate political science students. The results of the experiments provide evidence of an underlying free-rider problem and support for the contention that selective incentives are an effective means of overcoming this problem. In another level of analysis, the experiment also shows that even basic student-to-student on-line discussion can be an effective teaching tool, rivaling the effectiveness of more costly traditional web sites.*

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*"I like this stuff, but somehow I can never get discussion going." -- Neal Beck, UCSD political science professor, evaluating web-based discussion.*

## Introduction

One of the most promising new teaching technologies to emerge in recent years is on-line discussion.<sup>1</sup> On-line discussion has the potential to improve the teaching and learning experiences in traditional classroom formats, as well as in distance learning. However, as the above quote illustrates, many instructors are finding that on-line discussion can be extremely disappointing in application.

This paper examines why on-line discussion often fails to live up to its promise as a teaching tool. In this paper, I primarily analyze on-line discussion from a standpoint of a problem of collective action. I then propose that providing students with selective incentives for participation can enhance on-line discussion. Experiments are then used to support the conclusion that providing such selective incentives enhances on-line discussion.

In addition, the paper compares the comparative costs and benefits of providing on-line discussion versus browse-only web sites to students in traditional classroom settings. I conclude that student satisfaction can be significantly enhanced through on-line discussion, even when this discussion does not involve a large amount of work or participation by the instructor. Further, the *tools* of on-line discussion are well-suited for organizing and enhancing traditional course web sites, even when on-line discussion itself isn't enabled.

## The Promise of On-Line Discussion

The promise of on-line discussion as a teaching tool is almost self-evident. With it, scholars and educators have the potential to vastly expand the opportunities for students to interact outside

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<sup>1</sup> Unfortunately, there are many terms in the literature for this sort of communication, including "computer-mediated communication," "on-line discussion," "discussion forums," "internet discussion groups," "computer graffiti," "computer conferencing," etc. In most cases, the terms refer to communication in which individuals use computers to place messages into a central database. All participants can then view these messages. Most of these forms allow asynchronous communication, which contrasts them with "chat" or other forms of messaging, which require participants to interact during in real time with other participants who are also on-line.

the classroom. In brief, the literature has argued that on-line discussion has the following desirable characteristics.

### **On-line discussion increases accessibility and opportunities for interaction**

Resources on the web are generally available 24 hours a day and 7 days a week (which is not true of many professors). Discussion forums are especially useful in this regard in that they allow student-to-student interaction to occur at any time and at any distance.

### **On-line discussion can break down social barriers**

One school of thought sees on-line discussion as a means to enhance student control over learning and make the educational experience "more democratic."<sup>2</sup> Other authors argue that discussion over computers can help enhance the participation of students might be less willing to participate in face-to-face discussion because of shyness, language problems, gender, etc. In any case, communicating through the medium of a computer can strip away many of the normal social cues of face-to-face interaction.

### **On-line discussion encourages more thoughtful and developed participation**

Since communication is asynchronous, participants can take their time ordering and composing their thoughts. In an on-line discussion forum, most communication falls in a category of "low stakes writing," and is regarded as encouraging clarification and facilitating useful responses from peers and instructors.<sup>3</sup>

### **On-line discussion fosters active learning**

Participation in face-to-face discussion is often viewed to be a valuable tool for engaging students in a more active form of learning. The simple act of attempting to communicate an idea to another person often presents a valuable opportunity for reviewing that idea. Moving the discussion on-line is argued to add another dimension to this activity.

When discussions take place on-line, "Students become 'active choosers' as they decide what to read and what to disregard. They also become 'active investors' because [on-line discussions] yield greater returns the more students invest in them."<sup>4</sup> The resulting discussion becomes available

"...for participants to retrieve and review at their leisure. The transcript, as an evolving artifact of the on-line discussion, is a significant resource for learning."<sup>5</sup>

## The problem: "Virtual discussion" often translates into virtually no discussion

Contrary to the theoretical hopes expressed in the previous section, however, on-line discussion often turns out to be surprisingly inactive in practice. After going through the trouble of constructing an area for cyber-discussion, moderators too often find that their boards receive only sporadic, if any, posting. For example, one UCSD political science instructor has provided his students with an on-line Usenet discussion area for several quarters. So far, not a single student

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<sup>2</sup> For an example of this, see Harasim 1989.

<sup>3</sup> McKeachie 1999.

<sup>4</sup> Gillette 1996, p. 63.

<sup>5</sup> McCabe 1998, p. 77.

has posted a message. In another case, an instructor at the University of Maryland who enhanced his teaching with a variety of web tools indicated that he anticipated that a class discussion group would be the most used resource for the class. Instead, a survey revealed that a chat area was "the least used and least liked by students," and that very few students used or liked the discussion forum.<sup>6</sup>

These difficulties are not unique to political science classes, or even teaching. Studies of on-line newsgroup activity report little or no activity on some boards for weeks at a time.<sup>7</sup> And one only has to go to webmaster communities on-line to hear the consternation regarding the "deafening silence" on various discussion forums.<sup>8</sup> If on-line discussion is so wonderful, why does it seem to have so many problems in execution? The following section uses a hypothetical example to highlight the underlying causes of on-line inactivity.

### **A hypothetical example of the problem**

Let us begin by assuming that a student (Judy) wants to post a message to a brand-new discussion forum that's been set up for her class. In order to do so, Judy must first pay costs to learn how to use the technology (**learning costs**). Then, Judy must take the time to actually log on, compose, and submit her post to the board (**opportunity costs**). Judy also faces the typical **social costs** associated with discussing a topic in front of her peers. None of these costs are trivial

And what does our intrepid student receive in return? Unless someone else posts a reply, Judy receives nothing. In fact, in order to know whether her message has received a reply, Judy must continue to check the discussion board over and over (**monitoring costs**). If no reply was ever sent, it seems intuitive that Judy has wasted a big chunk of her time for no gain.

Now let us examine the incentives for the rest of Judy's class. Let us go so far as to assume that two other students in Judy's class (Jeff and Susan) each have an interesting and relevant reply they could send to her original post. Let us further assume that Jeff and Susan have already invested the time to log on to the discussion board and read Judy's original message. If they've read the original post by Judy, why wouldn't they simply reply?

The main obstacle to either Jeff or Susan replying is that, almost by definition, they receive no informational benefit from replying to Judy's post. Both of them *already know* the content and nature of their reply.<sup>9</sup> So while their action could benefit Judy and the rest of the class, they have

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<sup>6</sup> Goff 1999.

<sup>7</sup> Rojo and Ragsdale 1997.

<sup>8</sup> Here's a representative sample from the Discus community of webmasters: **By Zozzles T. Freep on Friday, September 11, 1998 - 03:51 pm:** "One would think that if they had set up a discussion resource that at least some people would want to discuss something. When I recently resurrected my BEAM Heretics board ([www.serve.com/heretics](http://www.serve.com/heretics)) from the ashes, I got some rather positive email, but nothing seemed to be happening on the board itself. For the past week and a half one other guy and I have been adding content, but as I said in the subject, all I was hearing was a deafening silence." Other examples abound.

<sup>9</sup> Some educational theorists would argue that the process of formulating and editing a reply is inherently educational for students. While this may be the case, what is important here is Jeff and Susan's own estimation of how worthwhile such a reply would be. Also, some individuals undoubtedly derive personal satisfaction from helping a fellow human being in need. What is unknown is how many such people are in the class, and whether Jeff and Susan are examples of such people.

little if any personal incentive to take that action. In fact, because of the technological and opportunity costs, they must actually pay a net cost to benefit Judy (and the rest of the class).

A final nail in the coffin of good discussion is the fact that Judy is probably aware of the dilemma faced by any students considering a reply to her message. Because Judy is aware how little incentive her peers have to reply, she in turn is less likely to take the effort to post her original message, or might be tempted to spend more time seeking her information privately, such as by e-mailing her question to the professor. This forms a pretty obvious vicious circle.

The above illustrates the powerful incentives to “lurk” on, but not post to, a discussion forum. In most cases, students receive a much higher benefit from riding free on the efforts of their classmates. Since all members of the class can benefit equally from the results of the discussion, on-line discussion forums tend to reduce to an n-person prisoner’s dilemma, producing a low equilibrium level of posting. Especially in cases where private goods such as e-mail or office hours exist as alternatives, on-line discussion can fail to achieve its potential.

### The solution: Apply the logic of collective action

Mancur Olson’s *The Logic of Collective Action* is a good starting point for any discussion of the problems of collective action. On-line discussion at first glance appears to be a good example of a typical collective action problem: The class as a whole has a common interest in providing good on-line discussion. Clearly no individual can provide discussion alone, so discussion is by its very nature a collective good. Further, the on-line discussion is a “pure public good,” in that each person accessing the web site can read the discussion whether they contributed or not, and each person’s reading does not diminish the ability of others to view the same page.<sup>10</sup> However, there are many important differences between Olson’s assumptions and the reality of on-line discussion. Some of these differences help improve the prospects for collective action, but others actually make matters much, much worse.

#### **How is on-line collective action easier to achieve?**

The first advantage of on-line collective action over more traditional forms relates to Olson’s logic of costs. Olson argued that:

One thing that will hold true in every case, however, is that the total cost function will be rising, for collective goods are surely like non-collective goods in that the more of the good taken, the higher the total costs will be.<sup>11</sup>

On the internet, subject to performance constraints on the part of a server, it is almost as cheap to establish a discussion forum used by hundreds or thousands of people as it is to set up a forum used by ten or twenty people.<sup>12</sup> Once the up-front costs are paid to establish the forum,

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<sup>10</sup>The definition of pure public goods comes from Olson 1971, p. 14, fn 21. While discussion forums can be set up to restrict viewing to a group of registered users, contributing (e.g. posting replies) is impossible unless people can read the previous posts to the board.

<sup>11</sup>Olson, p. 22.

<sup>12</sup>In fact, the same Discus Pro discussion forum program used to host the two classes in this paper is used by *USA Today* to host their official discussion forum. The *USA Today* forum has received over 26,000 posts so far, and can be viewed at <http://jas1.usatoday.com/discus/board.html>.

most of the non-content maintenance costs are trivial unless the number of users exceeds the capabilities of existing equipment, which is unlikely in most educational settings.<sup>13</sup> In any case, such costs are generally not borne directly by on-line discussants, who must only pay the sort of constant message-related costs mentioned in the previous section.

In large part based on his assumption of increasing costs, Olson argued that “the larger the group, the farther it will fall short of providing an optimal amount of a collective good.”<sup>14</sup> In on-line discussion, on the other hand, some have argued that the larger the group, the more likely the group will be to foster active contributions.<sup>15</sup> While this is not necessarily an advantage in small-classroom settings, problems inhibiting in-person discussion have a correlation to class size: Huge lecture classes are likely to “need” on-line tools for discussion more than a small seminar, anyway.

In addition, on-line discussion forums have another advantage over traditional collective action problems: In most educational settings, the issue of organization has already been decided. A class is a pre-existing organizational structure, and what’s more, it already has an authority figure charged with leading the pursuit of the common educational goal and vested with formal powers.

### **How is on-line collective action harder to achieve?**

However, despite each of these advantages over traditional collective action problems, on-line discussions do have one sizable disadvantage: As was noted in the Judy-Jeff-Susan example, no user benefits directly from their own actions. One of Olson’s chief avenues for solving collective action problems was the reliance on “fat cats” who received such a large payoff from the collective good that they were willing to pay the costs for the group.<sup>16</sup> The other main strategy, providing selective incentives, forms the basis of this paper’s experiment and will be discussed below.

Given the constraints and benefits we’ve discussed above, therefore, there are two general strategies for increasing participation in discussion forums: Lowering the costs to students, or raising the benefits of their participation, particularly through the use of selective incentives.

### **How do we lower student costs?**

#### **Reduce learning costs**

There are many learning costs associated with browsing the internet. At this point, most students seem to have a basic familiarity with the internet. Discussion tools that build on that existing familiarity help lower learning costs. An ideal discussion tool should use a standard browser for an interface (rather than proprietary software), be accessible from any internet-capable computer (regardless of operating system or processor speed), and should run at an acceptable speed.

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<sup>13</sup> As I will discuss later, the content costs associated with monitoring, encouraging, or responding to posts to the forum is most certainly not trivial. However, simple tasks such as archiving or pruning old messages or backing up the board can be done automatically with most forum software.

<sup>14</sup> Olson, 35.

<sup>15</sup> Matzat 1998. To illustrate this point, imagine that Judy thinks that the students in her class each have a 1% probability of responding to her post. It would therefore be logical to conclude that Judy would be more likely to receive a reply if there were 100 students in the class, rather than just 10.

<sup>16</sup> Hence Olson’s paradox of the “exploitation of the great by the small.” See Olson, Chapter I, sections D and E.



Additionally, it is important that the site's design be clear and intuitive, and that the discussion be organized in a logical manner.<sup>17</sup> Also, I have found that a brief, 15-minute in-class introduction to the course web board can help familiarize students with the site.

### **Reduce monitoring costs:**

Repeatedly checking a web discussion forum for replies to one's messages is tedious and time-consuming. Many software packages allow users to establish accounts that will automatically notify them via e-mail when a reply to one of their messages has been posted. Although this option can increase learning costs for students, it can help reduce monitoring costs substantially, since most students are likely to check their personal e-mail more often than they would browse the course web site.

### **Reduce social costs:**

An easy way to avoid these costs is to allow "public" posting on a site, such that users can opt to attach any name they like to their posts. However, allowing public posting to a discussion board also removes social (or other) sanctions against undesired behavior.<sup>18</sup> In addition, requiring user accounts is a necessary condition for providing selective incentives. However, requiring users to establish such accounts increases the learning costs for students.

The Discus discussion forum program provides an excellent compromise on this issue: Registered users can (at the discretion of the board's moderators) post "anonymous" messages to the board. However, the board moderators have the ability to view the username and IP address of users posting these messages.<sup>19</sup> In addition, Discus allows users to import delimited class rosters and automatically generate usernames and passwords.

### **Increase the expected benefit to students**

#### **Increase the expected value of student discussions:**

If students don't initiate discussions, moderators can often pose intriguing questions or topics. Some professors include "mini-essay" questions, while others present interesting topics that have come up in private e-mails or office hours. Discussions that are more closely linked with graded projects might be expected to have higher immediate utilities for students than general discussion. An example might be a discussion of review questions for an exam. However, while each of these discussion areas has a high expected utility for students, they still suffer from the problem that the students still do not directly benefit from their own postings.

A more direct way to reward students for their participation is through the use of **selective incentives**, which reward individuals for acting for the common good. These incentives can take the form of informal or formal rewards (or punishments, as the case may be). Informal rewards

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<sup>17</sup> I recommend using Discus Pro or Ultimate Bulletin Board to minimize these costs, although most web-based discussion boards are ok. I would encourage instructors to avoid using the Usenet or proprietary conferencing software with novice users, if at all possible. Also, in terms of organization, linear discussions seem to be easier for students to pick up than threaded discussions.

<sup>18</sup> For example, in a previous class I taught, a student used a fake name to post an insulting message about a fellow student's post. It was impossible to tell which student had posted the message, so no sanctions were possible. Patrolling for such abusive messages is a daunting task, and many professors cite these concerns in opting not to include discussion in their web sites.

<sup>19</sup> In addition, such registration makes distributing selective incentives easy.

can be as simple as mentioning particularly interesting or appropriate posts in class, or through complimenting students in person or by e-mail. Formal rewards consist of tying a portion of the student's grade to their activity in the forum. A substantial portion of the remainder of this paper will be used to examine an experimental application of these formal rewards.

The use of these formal rewards has been attacked as being needlessly paternalistic or heavy-handed. The argument often goes that students are the best judges of their study and learning styles, and that forcing them to engage in study activities they would not otherwise undertake is foolhardy. Also, some argue that on-line discussion necessarily penalizes students with poor typing skills, little computer experience, or poor access to computer facilities.<sup>20</sup> As I will demonstrate later, such selective incentives are useful for the following reasons:

- Students might want to participate in collective action, but fail to because of their collective action dilemma
- Even a small reward can be sufficient to produce the desired participation
- Students who have not participated in an on-line forum might under-estimate the utility of such forums

**Increase the expected chance that students posts' will be addressed:**

The simplest way to do this would be to commit the professor or TA to answer all questions.<sup>21</sup> In fact, in a study on computer conferencing, Margaret Foley McCabe concluded that "At a most basic level, the teachers' frequent participation [in on-line discussion] was critical to the success of ... the courses."<sup>22</sup> Professors in McCabe's "successful" courses estimated that they spent one to two hours seven days a week reading student comments, composing responses, and reviewing on-line course work for classes ranging from 6-9 students. In McCabe's "unsuccessful" case, students attributed problems of sparse interaction, disjointed conversation, and student dropout primarily to the teacher's lack of on-line participation.

Clearly such a time commitment presents a serious problem for faculty, especially if the on-line discussion is in addition to normal face-to-face interaction, e-mail, office hours, etc.<sup>23</sup> While students would undoubtedly be receiving better service and attention from faculty, McCabe herself indicates that such efforts "raise real issues about appropriate workload and compensation."<sup>24</sup>

Fortunately, other authors have suggested alternate means of achieving this end. In particular, it has been suggested that higher amounts of past group participation will lead to higher probabilities that individuals will post their questions later.<sup>25</sup> This line of reasoning seems to

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<sup>20</sup> See Althaus 1996, 17-19. While Althaus argues against making computer access "mandatory," students in his forum were given class participation credit which required students to post one message per week to receive full credit (see page 6-7 of Althaus).

<sup>21</sup> As a side benefit, this would also increase the expected usefulness of any particular answer, as compared to answers from peers.

<sup>22</sup> McCabe, 83.

<sup>23</sup> Some efficiency gains are possible through the use of the new technology. In particular, providing class handouts and frequently-asked-questions on the web site can improve student service. Doing so through a discussion forum like Discuss allows professors to provide these services at a minimal cost.

<sup>24</sup> McCabe, 84.

<sup>25</sup> Matzat, (page number N/A... on-line document, available at <http://www.sosig.ac.uk/iriss/papers/paper19.htm>).

suggest that most discussion forums are like middle-school dances, in which no individual wants to be the first on the dance floor, but will gladly join in if the dance floor is already crowded. However, it is easy to see how this can reduce to a chicken-and-egg quandary, in which participation is required to beget participation. Selective incentives, discussed below, can provide a means through which participation can be initiated and hopefully sustained.

## Methodology

This study uses a controlled experiment to examine the on-line interaction of students in two UCSD political science classes in Spring Quarter, 1999. Instructors in both classes were approached to participate in a pilot program, in which they would be given instruction and computer support to establish a Discus Pro discussion forum web page on the Center for Teaching Development's server (<http://ctd.ucsd.edu>).<sup>26</sup> The results of this project were intended to guide future department-level implementations of the Discus program.

## Sample

The first class was an upper-division political science class on the Presidency, PS100a, taught by Sam Kernell. The class had an enrollment of 150 and was taught using the lecture format.<sup>27</sup> Professor Kernell had established a traditional web site for this course in the past, but had been disappointed with how difficult it was to update his site over the course of a quarter.

While he was interested in incorporating on-line discussion in the future, Kernell was concerned about the time commitment involved in moderating and policing discussion, as well as the potential for student abuse. He therefore elected to disable student-to-student discussion for his class, and instead use the discussion board to assist with his traditional web site. Basically, Kernell used the Discus program as an archive for file viewing and downloads, link updates, announcements, and easily password-protecting copyright materials.<sup>28</sup> Kernell was also interested in using the Discus program's e-mail notification feature, which allowed registered users to be notified by e-mail whenever the course site was updated.<sup>29</sup> In effect, this was a conventional web page that used discussion-forum technology to enhance its efficiency.

The second class in the study was the department's Introduction to American Politics class, PS10. This class had an enrollment of 180 and was taught by Greg Bovitz, an ABD student in political science. Bovitz had good general computer skills, but no prior experience constructing web pages and using them for instructional purposes. Bovitz was also concerned about committing time to moderating on-line discussion, but eventually decided to incorporate student-

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<sup>26</sup> Discus Pro is a \$99 upgrade to the freeware Discus discussion forum program, available for download at <http://www.chem.hope.edu/discus>. We selected the Pro version because of the improved e-mail notification feature and administration tools.

<sup>27</sup>The class did include some small-group sections, but they were optional and directed at fostering particular group research projects.

<sup>28</sup> Kernell's class site used a central home page located in his personal account at <http://weber.ucsd.edu/~skernell/Ps100a98.htm>. He then used the links at the bottom of the page to transparently take users to the appropriate Discus directories. All material for the course except this home page and the syllabus were located on the Discus site.

<sup>29</sup>At Kernell's request, I made a 15-minute in-class presentation briefly demonstrating the web site and the e-mail notification feature. I also provided students with a handout.

to-student discussion in his site.<sup>30</sup> While Bovitz occasionally posted material to the site (particularly review questions for the exams and the syllabus), the site's content consisted almost exclusively of student-to-student posting.

Students in PS10 were expected to attend two one-hour lectures per week, in addition to another hour of small-group discussion led by one of the two class Teaching Assistants. To encourage student attendance in discussion section, teaching assistants are typically delegated the authority to determine a portion of each student's grade. This 10% "class participation" grade served as the basis for the experiment on selective incentives. In the **control** sections (those taught by Scott Basinger), students were assigned their participation score strictly on the basis of their face-to-face performance and attendance in section. In the **selective incentive** sections (those taught by Michael Molloy), only seven of the ten participation points were allocated on the basis of face-to-face interactions. The remaining three points were allocated for registering for a user account on the class discussion forum, and for making at least two "substantive" posts to the forum.

### **The Experimental Design**

The experiment examined relationships at two levels of analysis. The first comparison was at the section level within PS10 and examined patterns of participation, satisfaction and access between the selective incentive and control sections. The main purpose of the experiment was to test the logic of the public-goods conception of on-line discussion, and to examine how providing selective incentives to one group of students affected participation rates in discussion.

The second level of analysis was at the class level and examined differences in student and professor satisfaction between a conventional browse-only web site and a discussion site. It was also intended to evaluate differences in how students evaluated the utility and complexity of on-line discussion versus standard browse-only web sites.

### **Data collection**

The inherently computerized nature of on-line discussion made collecting information about student actions relatively easy. Discus Pro includes a log analysis function which quickly provided a complete listing of posting activity by individual users.<sup>31</sup> I also used Microsoft's Site Server Express program to analyze the raw Windows NT server logs to measure the rates at which students accessed the two sites.

Attitudinal information was gathered primarily through surveys administered to each class at the end of the quarter (see Appendix A for the full text of the surveys). The professors and teaching assistants were surveyed through a series of open-ended questions after the end of the quarter.

## **Results**

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<sup>30</sup> Bovitz originally intended to include a separate "Frequently-Asked Question" section in which he would interact more with students, but ended up not using this feature. Because of this, all student posts were made to an area of the board that was explicitly student-to-student.

<sup>31</sup> This function was also used by Molloy to determine which students would receive the selective incentives.

## Do students with selective incentives participate more in on-line discussion?

Yes, students in the sections with selective incentives were significantly more likely to participate actively in the on-line discussion forum. As Table 1 shows, the students with selective incentives were about four times as likely to register for a username and password,<sup>32</sup> and about five times more likely to have reported posting at least one message. The selective-incentive students were also significantly more likely to report visiting the board in an average week.<sup>33</sup>

**Table 1**  
**Self-Reported participation in on-line discussion**

	<b>Selective-Incentive Students</b>	<b>Control Students</b>	<b>t Stat</b>
<b>Percent of students who registered for a username and password</b>	77%	21%	-6.411 **
<b>Percent of students who reported posting at least one message to the forum</b>	51%	11%	-4.919 **

Note: (Survey n=98) Survey results are from the final class meeting, and thus do not include information about finals week.

Comparing these self-reported results to actual activity on the board, we find even more striking results. By the end of the quarter, almost nine out of every ten students with selective incentives had registered for a discussion forum username, while over seven in ten of selective incentive students had posted at least one message. The selective incentive students also produced significantly more messages on average than the control group.

**Table 2**  
**Actual rates of participation in on-line discussion**

	<b>Selective-Incentive Students (n = 84)</b>	<b>Control Students (n = 61)</b>	<b>t Stat</b>
<b>Percent (n) of students who established Discus usernames</b>	86% (72)	21% (13)	10.30 **
<b>Percent (n) of students who posted at least one message to the forum</b>	71% (60)	11% (7)	9.30 **
<b>Average (total) posts by students in each group</b>	2.04 (171)	.30 (18)	6.72 **
<b>Percentage (n) of students who posted</b>	29% (24)	5% (3)	4.16 **

<sup>32</sup> The PS10 forum was configured as a Private discussion area, which only allowed registered users to submit messages. As discussed in the section on decreasing social costs, this tends to raise the initial costs of submitting a message, but decreases the chance of mischief. Rather than providing a class roster, the class was set up to allow self-registration with e-mail verification. Users were able to register for a username at the site, but had to wait for an initial e-mail to be sent with their password before they could post their first message.

<sup>33</sup> The t-test on the difference between the two sections was 2.234. As will be discussed later, there was no statistical difference between whether students accessed the at least once during the quarter.

## more than two messages to the forum

Note: All percentages are based on the total number of students in the experimental groups, and not just the subset who registered or who posted at least one message. These results include posting activity during finals week.

In addition, Table 2 highlights the disproportionately large volume of posts originating with selective incentive students. Over nine out of every ten posts on the board came from a selective incentive student, with students in these sections averaging over two posts to the board per student.

It should be noted that the average number of per-student posts in the selective-incentive sections is almost an exact match to the two-post minimum necessary to receive the full selective incentive. However, about 30% of total students in the selective incentive sections (and 40% of those who posted at least one message) posted more than the required number of posts. In comparison, only 5% of the total students in the control group (but 42% of the students who posted at least one message to the forum) posted more than two messages. This suggests to me the strong possibility that once students have been enticed to participate at a basic level in on-line discussion, a sizable group will continue to participate beyond levels dictated by their original selective incentives.

### **Are students who don't "participate" still receiving benefits?**

The heart of the issue of free-riding is whether students believe they can receive benefits without paying any costs. The previous section established that students without any selective incentives to generate on-line discussion were less likely to do so. This section is intended to address the second component of free-riding... did the students who chose not to post messages to the forum still derive educational benefits from reading the messages of others?

One imprecise measure of free-riding is to compare the number of posts to the number of visits to the site. As I mentioned earlier, students posted a total of 199 messages to the class web page over the course of the quarter. My analysis of server logs, on the other hand, points to 1,686 separate visits to the site. Each visitor viewed an average of 7.71 different pages per visit, and spent a total of nearly six minutes between their first and last request at the site.<sup>34</sup> This implies a substantial level of "lurking," despite the somewhat low number of actual posts.

To provide another measure of free-riding, I examined the survey questions that solicited student opinions about the class web site.<sup>35</sup> My expectation is that if only students who post to the

<sup>34</sup> I don't use measures of "hits" because they inherently inflate any measure of web site activity by including any connection to an internet site, including server errors, individual graphics, etc. Measures of "requests" drop all of the inflating measures and register only one request per page loaded. A "visit" is thus defined by the Site Server Express Analysis as "a series of consecutive requests from a user to an Internet site. If your log file data includes referrer data, then new visits begin with referring links external to your Internet site. Regardless of whether you have referrer data, if a user does not make a request after a specified time period, the previous series of requests is considered to be a completed visit." (Note: Active users are tracked by IP address or internet hostnames. Our server does not store referrer data.)

<sup>35</sup> Another way to measure educational benefits might be to compare the final course grades of students who did and did not post messages to the forum. However, grading results would likely be obscured by the common practice of synchronizing grading across sections.

forum derive educational benefits from their actions, they should be more satisfied with the web site. If all students benefit from the posts, then the posters and non-posters should, on average, be equally satisfied with the web site.<sup>36</sup>

Table 3 shows substantial support for the public goods hypothesis, with both posting and non-posting students showing substantial agreement about the value of the forum.

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<sup>36</sup> In fact, given that they had to pay lower costs, non-posting students might even be expected to have higher levels of satisfaction with the site than posters.

**Table 3**  
**Average agreement/disagreement with various statements regarding the PS10 course web site (posters vs. non-posters)**

	Students who posted at least one message	Students who didn't post a message	t Stat
<b>Agree/Disagree: "The course web site significantly enhanced my learning in this course."</b>	3.57 (1.96)	3.62 (1.56)	-0.17
<b>Agree/Disagree: "Other courses should adopt a web site like the one provided for this course."</b>	2.37 (1.42)	2.29 (1.88)	0.32
<b>Agree/Disagree: "The course web site significantly enhanced student-to-student interaction in the course."</b>	2.34 (1.47)	3.35 (2.20)	-3.63 **
<b>Agree/Disagree: "The course web site significantly enhanced student-to-instructor interaction in the course."</b>	3.91 (1.84)	4.03 (1.58)	-0.43
<b>Agree/Disagree: "The course web site was easy to use."</b>	2.31 (0.75)	2.44 (1.25)	-0.64
<b>Rank ordering of "discussion forum" in 7-item list of desirable web site components<sup>37</sup> (1=best)</b>	3.37 (3.95)	4.75 (2.92)	-3.45 **

Note: Numbers are averages, with variances in parentheses. In the first five items above, students were asked to rate their agreement/disagreement with various statements on a standard 7-choice scale, where 1=strongly agree; 2 = agree; 3 = agree somewhat; 4 = uncertain; 5 = disagree somewhat; 6 = disagree, and 7 = disagree strongly.

Both groups were statistically indistinguishable in their evaluation of how much the web site enhanced their learning (agreed somewhat to neutral on average); whether other courses should adopt similar web sites (agreed on average); whether the site enhanced student-to-professor interaction (neutral on average), and whether the web site was easy to use (agreed on average).

Posters differed significantly from non-posters in that posters were significantly more likely to believe the site enhanced student-to-student interaction (posters agreed, while non-posters only agreed somewhat on average). They also differed in their rank ordering of discussion versus other potential web site components, ranking it more than an item higher in importance.<sup>38</sup> These differences are surprising, especially the latter ranking result.

<sup>37</sup> The included choices were Professor Contact information; Syllabus; Sample Assignments; Test Review Questions/Previous Year's Exams; Class Discussion Forum; Images Related to the Class; and Assigned Articles.

<sup>38</sup> Similar results are derived from duplicating the analysis above for selective incentive versus non-selective incentive students.



## How do discussion-only sites compare to conventional web sites?

In some sense, the two web sites I examined approach the same goal from polar opposite approaches. The PS10 discussion forum is an example of a grass-roots style of learning, in which students were responsible for constructing their own web educational experience with little or no guidance from authority, with the notable exception of the exam review questions. The PS100a web site, on the other hand, was used as another conduit for the professor-to-student communication that typified the conventional top-down format.

The web sites can be compared along a number of dimensions. Table 4 begins the comparison by examining the visitation patterns across the two sites.

**Table 4**  
**Visitation pattern for PS10 and PS100a**

	<b>PS 10 (discussion-only site, 180 students)</b>	<b>PS 100a (browse-only site; 150 students)</b>
<b>Total number of html pages viewed, Spring Quarter 1999</b>	13,003	14,952
<b>Total number of separate "visits" to site, Spring Quarter 1999</b>	1,686	5,799
<b>Average visit duration, Spring Quarter 1999</b>	5:56	1:21

Note: Information for PS100a does not include a separate password-protected subdirectory, which was used to secure several documents in accordance with copyright law.

To briefly characterize the differences across the two sites, students in the discussion forum site were making far fewer visits, but spending more time at the site during each visit. The logs further show browse-only students averaged about five minutes per visit at the start of the quarter, but then averaged less than a minute per visit for the last seven weeks of the quarter. In comparison, the discussion students continued to average about five minutes per visit throughout the quarter, with peaks of around ten minutes per visit around the time of the midterm and final examinations.

A likely explanation for the visitation patterns stems from the manner in which content was added to the two sites. In the browse-only site, most course material was added at the start of the quarter, with items added one-by-one through the quarters. Over half the students in that class signed up for e-mail notification, which included a direct link to this new content as it was added. In contrast, the new content in the discussion forum was larger in volume and was distributed more evenly throughout the quarter. It is impossible to tell from this information whether the differences in duration represent a larger amount of useful content in the discussion forum, or a more efficient presentation and digestion of information in the browse-only site.

The class surveys provide more insight into the differences between the two sites. Table 5 provides a breakdown of key survey questions asked to both classes.

**Table 5**  
**Comparison of web site attitudes between PS10 and PS100a students**

	<b>PS10 (discussion-only site)</b>	<b>PS100a (browse-only site)</b>	<b>t Stat</b>
<b>Agree/Disagree: "The course web site significantly enhanced my learning in this course."</b>	3.60 (1.69)	3.00 (1.56)	3.30**
<b>Agree/Disagree: "Other courses should adopt a web site like the one provided for this course."</b>	2.32 (1.70)	2.38 (1.60)	- 0.32
<b>Agree/Disagree: "The course web site was easy to use."</b>	2.40 (1.06)	2.04 (0.57)	2.79 **
<b>Rank ordering of "discussion forum" in 7-item list of desirable web site components (1=best)</b>	4.26 (3.67)	5.74 (1.67)	5.92 **

Table 5 begins to shed light on the differences between the two course web sites. Students using the browse-only page were significantly more likely to believe on average that the course web site significantly enhanced their learning. On the other hand, there was virtually no difference in the two classes' average agreement that other courses should adopt similar web sites. Not surprisingly, students using the discussion forum found their site harder to use on average than students in the browse-only class did, but both generally agreed the sites were easy. Finally, despite the huge variation within the discussion-only students about the relative ranking of discussion in a web site, they still ranked discussion significantly higher than those who had used a browse-only site did.

### Caveats

However, the results presented here must be viewed with some caution. First, while the underlying causes are not always clear to faculty, there do seem to be patterns in the distribution of students among sections. Issues such as scheduling around common classes or desired sleeping habits can noticeably influence the composition of a particular section, as most teaching assistants can attest.<sup>39</sup> Similarly, while students do not know in advance which teaching assistant

<sup>39</sup> In this case, the smallest of the selective incentive sections seemed to produce noticeably less posting activity than the other two sections (which more closely resembled each other). However, the students in this section were still more active in their on-line participation than either of the control sections.

will be assigned to their particular discussion section, some students might have taken advantage of the drop-add period to shift between sections.<sup>40</sup>

Second, although it might seem like an obvious point, PS 10 students already had avenues available for discussion and interaction in their discussion sections. This probably means that students without such options would place a higher value on the option for on-line discussion. At the least, it would seem to imply that the results presented here might actually underestimate the likely effects of selective incentives upon discussion.<sup>41</sup> It also says little about the potential effectiveness of other methods of encouraging participation.

Third, the analysis here has generally been quantitative, rather than qualitative. Given more time, I would have liked to explore the content of student dialogue on-line. In particular, I am concerned about the possibility that students were only making perfunctory posts for the sole purpose of getting the class credit.<sup>42</sup>

Finally, the cross-class comparisons must be taken with the largest grain of salt. Students in the upper-division class on the presidency are almost by definition older and more advanced in their studies than students in the introductory class. In addition, the introductory class tends to attract higher numbers of non-political science majors fulfilling university requirements.

## Analysis

Despite these considerations, this study has produced some persuasive answers to the following questions.

### **Are selective incentives justified to encourage on-line participation**

Yes, selective incentives appear to be justified. While they are coercive in nature, they appear to be a necessary and effective means of overcoming the incentive to free-ride. This study has also shown that even small (but clear) incentives can be sufficient to produce the desired effect. In addition, forcefully encouraging on-line participation may pay dividends because students who have not participated in discussion seem to discount their expected benefit from on-line discussion.<sup>43</sup>

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<sup>40</sup> However, at least one of the teaching assistants involved in the experiment indicated that "there wasn't much switching in either direction and I don't think that would have affected anything..." E-mail from Michael Molloy to author, received on August 17, 1999.

<sup>41</sup> In some ways, I would have preferred to have PS100a be the discussion site, and have PS 10 be the traditional web site. However, switching the sites would have made the management of the experiment much more complicated: Using pre-existing discussion sections allowed easy administration and enforcement of the treatments, while avoiding the likely experimenter and self-selection effects of having two different incentive schemes within a single lecture class (note: it is fairly common for teaching assistants in discussion sections to vary their grade criteria and activities, so the experiment was probably not obvious to the involved students).

<sup>42</sup> A cursory examination of student posts seems to show that this is probably not the case, although the preponderance of questions over answers is often worrisome. In my own experience, I have seen cases where students attempted to fulfill the posting requirements through repeating the same posts verbatim (to fool the log analysis). In one case, two students apparently sat side-by-side in a lab and staged an elaborate "debate" between themselves in an odd class-credit kabuki. This sort of academic fraud is one reason why I believe larger selective incentives are not necessarily preferable over small ones.

<sup>43</sup> It is difficult to tell whether this is because of unfamiliarity with on-line discussion as a tool, or rather because of their previous poor experiences with other on-line discussion. In fact, it might simply reflect the manner in which active and successful participation has updated the expected benefit calculations of participants.

## Is the on-line discussion forum an efficient teaching tool?

In this case, class discussion seems to have been very efficient as a teaching tool. The instructor of PS10 was able to increase the learning opportunities of a substantial portion of his class at little or no cost to himself.<sup>44</sup> Students, in turn, received a valued learning tool at little or no cost to themselves.

More importantly, the discussion forum itself is an efficient and useful tool for creating and administering course web sites at the departmental level. Currently, building most web sites is rather like building a log cabin in pioneer times: While the authorities have generally provided the space for the structure to be built, it is up to the pioneer to acquire the raw material, knowledge, and sweat required to actually build a home. Using a discussion forum to administer web sites, on the other hand, is the equivalent of providing instructors with their own customized condominium: The building has already been constructed by skilled professionals specializing in the task, and instructors need only "furnish" it with their own desired materials, which can be quickly and easily uploaded or even pasted into documents.<sup>45</sup>

## Conclusion

On-line discussion is a teaching tool that has often been more attractive in theory than in practice. This paper argues that the limitations that have seemed to hobble on-line discussion are actually fairly easy to understand and counteract. In this case, the application of selective incentives for participation successfully overcame the free-rider problem in the forum, leading to a collected knowledgebase that benefited all students in the class.

However, the benefits of discussion forums go beyond the demand side of the equation: Discussion forums have the capability to significantly reduce the costs faculty pay in establishing course web sites. The tools of on-line discussion are extremely powerful, cheap to acquire, easy to learn. They present an attractive first step for faculty who have previously been unable or unwilling to establish a course web site, while granting more advanced faculty an impressive array of powerful web tools.

While discussion forums will undoubtedly be eclipsed by future technological developments, at present they are perhaps the best "bang-for-your-buck" web tools available to instructors. I highly encourage departments to download a free copy of Discus (or a competitor) and try the technology out.

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<sup>44</sup> The costs appear to have been around five hours total for the entire quarter. These costs were mitigated by the assistance of CTD staff in the original web site set-up, but again such costs were minimal, and will become even more so in the future as Discus incorporates topic "templates" that will allow almost-instantaneous setup of class web site hierarchies. CTD also bore some costs over the course of the quarter as students lost or misplaced their passwords or usernames. These nuisance costs could probably have been minimized through a 15-minute in-class training session or handout along the lines of the one delivered to PS100a.

<sup>45</sup> The Hope College Chemboard (<http://www.chem.hope.edu/chemboard/>) is another application of this sort of "condominium"-style web page.

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## Appendix A1: Survey Administered to PS 10

This anonymous survey is intended to help us improve the web-based course material provided to undergraduates at UCSD. Your participation is voluntary.

1. Please indicate the name of your T.A.: **Michael Molloy / Scott Basinger**

2. Have you ever accessed the web page for this course? **Yes / No**

If not, please tell us briefly why not \_\_\_\_\_

3. Did you register for a user account on this course's web page? **Yes / No**

If so, did you enable e-mail notification of posts? **Yes / No**

4. Have you ever posted a message to the class discussion forum? **Yes / No**

If so, did you find it helpful? **Yes / No**

If not, please tell us briefly why not \_\_\_\_\_

5. How often *per week* did you access the web site for this course?

**About Once    Two or Three    Four or Five    Six or Seven    More than Seven Times**

6. How often *per week* do you generally check e-mail?

**About Once    Two or Three    Four or Five    Six or Seven    More than Seven Times**

7. Which parts of the course web site did you consider to be most valuable?

8. Which parts of the web site did you consider to be least valuable?

9. Please **rank** the following items in the order in which you think they would enhance course web pages for classes like this one? (1= enhances most; 7 = enhances least)

\_\_\_ Professor Contact information

\_\_\_ Class Discussion Forum

\_\_\_ Syllabus

\_\_\_ Images related to the class

\_\_\_ Sample Assignments

\_\_\_ Assigned articles

\_\_\_ Test Review Questions/ Previous years' exams

10. Indicate whether you agree or disagree with the following statements about this course's web site:

a. "The course web page was easy to use"

Agree Strongly	Agree	Agree Somewhat	Neutral	Disagree Somewhat	Disagree	Disagree Strongly
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b. "The course web page significantly enhanced my education in this class"

Agree Strongly	Agree	Agree Somewhat	Neutral	Disagree Somewhat	Disagree	Disagree Strongly
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c. "I think that other courses should provide similar web pages"

Agree Strongly	Agree	Agree Somewhat	Neutral	Disagree Somewhat	Disagree	Disagree Strongly
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d. "The web site promoted student-to-instructor discussion"

Agree Strongly	Agree	Agree Somewhat	Neutral	Disagree Somewhat	Disagree	Disagree Strongly
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e. "The web site promoted student-to-student discussion"

Agree Strongly	Agree	Agree Somewhat	Neutral	Disagree Somewhat	Disagree	Disagree Strongly
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## Appendix A2: Survey Administered to PS 100a

This anonymous survey is intended to help us improve the web-based course material provided to undergraduates at UCSD. Your participation is voluntary.

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1. Have you ever researched a class web page before signing up for a course? **Yes / No**
  2. Have you ever accessed the web page for this course? **Yes / No**  
If not, please tell us briefly why not \_\_\_\_\_
  3. Did you register for a user account on this course's web page? **Yes / No**  
If so, did you enable e-mail notification of posts? **Yes / No**
  4. Did your course devote any class time to introducing and demonstrating the course web page? **Yes / No**  
If so, did you find it helpful? **Yes / No**
  5. How often *per week* did you access the web site for this course?  
**About Once    Two or Three    Four or Five    Six or Seven    More than Seven Times**
  6. How often *per week* do you generally check e-mail?  
**About Once    Two or Three    Four or Five    Six or Seven    More than Seven Times**
  7. Which parts of the course web site did you consider to be most valuable?

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8. Which parts of the web site did you consider to be least valuable?

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9. Please rank the following items in the order in which you think they would enhance course web pages for classes like this one? (1= enhances most; 7 = enhances least)

- \_\_\_ Professor Contact information
- \_\_\_ Syllabus
- \_\_\_ Sample Assignments
- \_\_\_ Test Review Questions/ Previous years' exams
- \_\_\_ Class Discussion Forum
- \_\_\_ Images related to the class
- \_\_\_ Assigned articles

10. Indicate whether you agree or disagree with the following statements about this course's web site:

- a. "The course web page was easy to use"
 

Agree Strongly	Agree	Agree Somewhat	Neutral	Disagree Somewhat	Disagree	Disagree Strongly
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- b. "The course web page significantly enhanced my education in this class"
 

Agree Strongly	Agree	Agree Somewhat	Neutral	Disagree Somewhat	Disagree	Disagree Strongly
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- c. "I think that other courses should provide similar web pages"
 

Agree Strongly	Agree	Agree Somewhat	Neutral	Disagree Somewhat	Disagree	Disagree Strongly
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11. Please add any other general impressions or suggestions you have about this course's web site on the other side of this paper.